02-27-04 Image AF/2834

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF	:	Yuzuru Suzuki et al.
FOR	:	STEPPING MOTOR
SERIAL NO.	:	10/004,290
FILED	:	October 25, 2001
CONFIRMATION NO.	:	8147
EXAMINER	:	Hanh N. Nguyen
GROUP ART UNIT	:	2834
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RULE 37 C.F.R. §1.192 APPELLANT'S BRIEF

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Appeal Brief is in furtherance of the Notice of Appeal that was filed in this case on December 11, 2003.

The fees required under 37 C.F.R. §1.17 and any required petition for extension of time for filing this Brief and fees therefore are dealt with in the accompanying Transmittal of Appeal Brief.

Appellant files herewith an Appeal Brief in connection with the above-identified application wherein claims 2-3 were finally rejected in the final Office Action mailed August 27, 2003. What follows is Appellant's Appeal Brief (submitted in triplicate) in accordance with 37 C.F.R. §1.192(a).

CERTIFICATE OF EXPRESS MAILING

I hereby certify that this Rule 37 C.F.R. §1.192 Appellant's Brief is being sent by the United States Postal Service via Express Mail procedure in an envelope addressed to:Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, Mail Stop Appeal Brief-Patents. **Express Mail NO.: EL 998016925 US.**

By: Kathleen Nimrichter Date: 2-26-04

Kathleen Nimrichter

I. Real Party in Interest (37 C.F.R. §1.192(c)(1))

The real party in interest in the subject Appeal is the Assignee of the inventors named in the caption of this Brief (Yuzuru Suzuki, Kunitake Matsushita and Taketoshi Ohyashiki). The Assignee is Minebea Co., Ltd. of Nagano, Japan.

II. Related Appeals and Interferences (37 C.F.R. §1.192(c)(2))

There are no other applications involved in an appeal or interference before the U.S. Patent and Trademark Office from which the present application bases its priority, or any case which bases its priority upon the present application that will directly affect or will be directly affected by, or will have a bearing on the Board's decision in this Appeal.

III. Status of Claims (37 C.F.R. §1.192(c)(3))

The status of the claims set forth after the final Office Action mailed August 27, 2003 was and is as follows: allowed claims: **none**, rejected claims: **2-3**. The present Appeal is directed specifically to claims 2-3.

IV. Status of the Amendments (37 C.F.R. §1.192(c)(4))

No amendments to the claims were made after the final Office Action August 27, 2003.

V. Summary of the Invention (37 C.F.R. §1.192(c)(5))

The present application is directed to a stepping motor (claim 2) in which a stator unit includes a pair of stator sub-assemblies integrally attached to each other in a back to back manner (page 5, lines 12-15, and lines 24-26, and FIG. 2). Each stator sub-assembly has a plurality of pole teeth formed at its inner circumference and houses a coil inside thereof (page 5, lines 15-23). A rotor unit is rotatably disposed with a small gap from the plurality of pole teeth and has multiple magnetic poles formed on a circumference thereof (page 6, line 27 – page 7, line 5). The multiple magnetic poles of the rotor unit are formed by magnetizing the rotor unit alternately with an S pole and an N pole in a circumferential direction, wherein a magnetic pole width consisting of the S

pole and the width of the N pole in each pair are different from each other by a constant electrical angle ranging from 15 degrees to 50 degrees (page 7, line 8 – page 8, line 2, page 8, line 26 – page 9, line 1, page 9, lines 13-20, and FIGS. 5A-7).

A second embodiment is directed to a stepping motor (claim 3) comprising a stator unit which comprises a pair of stator sub-assemblies integrally attached to each other in a back to back manner (page 5, lines 12-15, and lines 24-26, and FIG. 2). Each of the stator sub-assemblies includes a plurality of pole teeth formed at an inner circumference of the sub-assembly and houses a coil inside thereof (page 5, lines 15-23). Each of the stator sub-assemblies also includes a rotor unit rotatably disposed with a small gap from the plurality of pole teeth and having multiple magnetic poles formed on a circumference thereof (page 6, line 27 – page 7, line 5). The multiple magnetic poles are formed by magnetizing the rotor unit alternately with an S pole and an N pole in a circumferential direction (Page 7, lines 8-12 and FIGS. 5A-5B). One pair of the S pole and the N pole has the width of the S pole set to be smaller than the width of the N pole, and another pair of the S pole and the N pole has the width of the S pole set to be larger than the width of the N pole, alternately arranged (page 10, line 13 – page 11, line 4, and FIGS. 8A-8B).

VI. Issues (37 C.F.R. §1.192(c)(6))

Whether claim 2 is unpatentable under 35 U.S.C. §103(a) over Saji et al., Japanese Document No. JP 60043060 A ("Saji").

Whether claim 3 is unpatentable under 35 U.S.C. §103(a) over Saji in view of U.S. Patent No. 4,968,913 to Sakamoto ("Sakamoto").

VII. Grouping of Claims (37 C.F.R. §1.192(c)(7))

The claims at issue do not stand or fall together. Specifically, claims 2 and 3 each recite separately patentable subject matter. Claim 2 recites a stepping motor including a rotor unit having multiple magnetic poles formed on a circumference, alternately with an S pole and an N pole in a circumferential direction. A magnetic pole width consisting of the S pole and the width of the N pole in each pair are different from each other by a constant electrical angle ranging from 15 degrees to 50 degrees.

Claim 3 recites a stepping motor with a rotor unit having multiple magnetic poles

wherein one pair of the S pole and the N pole has the width of the S pole set to be smaller than the width of the N pole, and another pair of the S pole and the N pole has the width of the S pole set to be larger than the width of the N pole, alternately arranged.

VIII. Arguments (37 C.F.R. §1.192(c)(8))

The Examiner rejected claim 2 under 35 U.S.C. §103(a) as being unpatentable over Saji. Claim 3 was rejected under 35 U.S.C. §103(a) as being unpatentable over Saji in view of Sakamoto. Appellants respectfully disagree.

1. Summary of Arguments

Appellants contend that, even if it is true that Saji discloses a stepping motor in which the N pole and the S pole of a permanent magnet are intentionally uneven, the structure of Saji is likely to cause a cogging torque of the motor to be increased. Such an increase is disadvantageous and is avoided by the claimed invention. Moreover, even if Saji is combined with Sakamoto, which is said to disclose a brushless motor in which no cogging torque is caused, it would not have been obvious at the time the invention was made to a person having an ordinary skill in the art to reach the invention recited in either claim 2 or claim 3 of the present application. Details of Appellant's arguments are provided in more detail below.

2. Appellant's Arguments Re: Claim 2

Saji is seemingly similar to the claimed invention in that the widths of the N pole and the S pole of a permanent magnet are made uneven intentionally, with the result that a mechanical angle or an electrical angle of a magnetic pole is changed intentionally.

Saji discloses that the "present invention concerns a, PM-type step motor with a significant detent torque so as to maintain the stopping position of the shaft in a precise, uniform and strong manner." (lines 1 - 3 under 3. Detailed Explanation of the Invention on page 1 of the translation of Saji). Saji further discloses that the "the widths of the north pole and south pole magnetized by the permanent magnet are made uneven by design" (page 3, last two lines) and "reinforcement of the holding force (detent torque)

of the rotor ... can be achieved by simply changing the widths of the magnetic poles of the permanent magnet." (page 7, lines 7-9). In other words, Saji positively states that the purpose of his invention is to increase the detent torque.

According to the method proposed by Saji, unbalanced difference in reluctance is provided between the stopping position and other positions of a rotor magnet with respect to salient poles of a stator in a non excitation state. This means, in turn, that a cogging toque will be increased when the motor is excited. Appellants understand that the Examiner suggests this by the assertion that "Saji recognizes the impact of the variation of mechanical degrees (or electrical degrees) of the permanent magnet on detent torque (inherently cause cogging torque) as described in page 3 and page 7 of the translation" (see page 5 of the final Office Action).

On the one hand, it is true that the stepping motor proposed in the present invention may be of such structure as to increase a detent torque. However, a cogging torque included in the excitation torque is decreased without distorting the excitation torque. In other words, the cogging torque is decreased without having a recess around the peak of the curve of the voltage characteristic of the counter-electromotive force, and with a smooth sine wave (FIG. 6 of the present application). This results in a smooth torque characteristic corresponding to the voltage characteristic by choosing or determining an appropriate range of unevenness of the widths of N pole and S pole. Appellants arrived at the appropriate range of unevenness only after experimentation. When the appropriate range of unevenness of the widths of the N pole and the S pole is employed, a motor with low vibration is obtained (FIG. 7 and page 9, lines 9-20 of the present application). Such a motor is recited in claim 2.

In short, in the present invention as recited in claim 2, the electrical angle by which the widths of the N pole and the S pole are made uneven is set with a view to decreasing the cogging torque on the basis of the above-described consideration, and as found by experiment. Therefore, the claimed invention was not within the level of skill of one having ordinary skill in the art, as contended by the Examiner on page 5, lines 5-7 of the Final Office Action.

Regarding the unevenness of the widths of N pole and S pole, Saji only teaches that "The enlarged width may be between 0 (zero)<(north pole width)<4W; ... by the aforementioned range" (Saji, page 4, lines 5-10). If the angle of unevenness is

expressed in terms of an electrical angle, it becomes 0 (zero)<(north pole angle)< 360° and the angles of the N pole and the S pole are not identical. Therefore, Saji neither discloses nor suggests any critical range of angle of unevenness, specified in order to decrease a cogging torque, as defined in claim 2 of the present application. In fact, Saji does not even mention the problem of cogging torque, much less propose a solution to the problem. Apparently, for Saji cogging torque is not a concern. For this reason, Saji discloses a range of angle of unevenness (0° to 360°) which may increase the cogging torque with detrimental results. In contrast, claim 2 recites a stepping motor in which a range of angle of unevenness is set to be between 15 degrees and 50 degrees. This range, which was only arrived at after experimentation, allows the motor to have a decreased cogging torque, resulting in low vibration for the motor.

While the 0° to 360° range of unevenness taught in Saji includes the claimed range of 15° to 50°, it cannot be argued that the range was known by Saji, or anyone else. *In re Rijckaert*, 9 F.3d 1531, 1533-34, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). As is explained in *Rijckaert*:

> "Obviousness cannot be predicated on what is unknown. *In re Spormann*, 363 F.2d 444, 448, 150 USPQ 339, 452 (CCPA 1966). Such a retrospective view of inherency is not a substitute for some teaching or suggestion supporting an obviousness rejection. See *In re Newell*, 891 F.2d 899, 901, 13 USPQ2d 1248, 1250 (Fed. Cir. 1989)." *Id* F.3d at 1534 and USPQ2d at 1957.

In conclusion, Appellants respectfully submit that one of ordinary skill in the art would not have developed the claimed invention from the structure of the motor of Saji. It simply would not have been obvious to one of ordinary skill in the art at the time the claimed invention was made. Thus, the rejection of claim 2 over Saji fails. Claim 2 is patentable over the art of record.

3. Appellant's Arguments Re: Claim 3

The preceding arguments in support of claim 2 over Saji apply as well to claim 3 of the present application. As described from page 10, line 20 to page 11, line 4, the difference in the embodiment as set forth in claim 3 versus the embodiment set forth in claim 2 is that the width of the S pole and the width of the N pole in one pair are set to be reverse to those widths in the adjacent pair. This feature is not disclosed in Saji as

the Examiner admitted in the final Office Action. Further, the smooth electrical performance for the motor as set forth in claim 3 was arrived at in a manner similar to that described for the motor as set forth in claim 2 (page 11, lines 5-13) and hereinbefore described.

Regarding Sakamoto, Appellants note that the Examiner was not persuaded by arguments asserting a difference in motor type as set forth in Amendment C. Appellants, however, wish to point out that there is a significant difference in technical concept between the stepping motor of the present invention and the brushless motor of Sakamoto, as described in more detail below.

As is clear from the drawing of Sakamoto, the motor has no salient poles in its stator and, therefore, it is a coreless motor. In such a motor, there is no change in magnetic reluctance between the stopping position and other positions of magnetic poles of the rotor. Therefore, the motor has no cogging torque and rotates smoothly if not excited.

Accordingly, Sakamoto proposes unevenness of widths of the N pole and the S pole of a permanent magnet in order to secure a smooth torque characteristic, without providing auxiliary poles, as in recited in claim 3 of the present application. Sakamoto's object is to improve a torque ripple characteristic representative of torque fluctuation caused when rotated by excitation, as described in Sakamoto, column 2, lines 15-17. To attain this purpose, the widths of the magnetic poles of the rotor are made uneven to adjust excitation timing and switching point. The Examiner states regarding claim 3, that "Sakamoto also aims at reducing cogging torque as shown in Fig. 6 and 7" (page 5, lines 7-8 of the Final Office Action). This, however, is a technical misunderstanding of Sakamoto, and is incorrect.

In contrast, since the present invention is directed to a stepping motor which has salient poles in its stator, magnetic reluctance changes with its rotation and causes a cogging torque. The cogging torque in turn causes change in excitation torque and disturbs smooth rotation. The cogging torque may cause vibration as well. Therefore reduction of the cogging torque is a vital problem specific to a motor with salient poles. A motor with no salient poles, such as the motor of Sakamoto, does not have this problem. Accordingly, Sakamoto does not even recognize the problem at which the claimed invention is directed, much less propose a solution to such problem.

Another point to be noted is that, in Sakamoto, a first pair of magnetic poles and a second pair of magnetic poles have different widths and, therefore, where the motor is rotated by exciting phase-by-phase, the amount of rotational movement, i.e. rotational angle for excitation of each phase, will be different. In contrast, in the present invention, a pair of magnetic poles N and S have a constant width P, and the amount of rotational movement for excitation of each phase is equal. In this way, there is a distinct technical difference concerning setting of the width of a pair of magnetic poles between Sakamoto and the claimed invention.

In rejecting claim 3 as being unpatentable over Saji in view of Sakamoto, the Examiner failed to show any motivation, suggestion, or teaching of the desirability for combining the inventions of Saji and Sakamoto. The teachings of Saji and Sakamoto can be combined by the Examiner only if there is some suggestion or incentive to do so. *In re Rouffet*, 149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998). The Examiner, on the other hand, used impermissible hindsight in combining the step motor of Saji with the two-phase brushless motor of Sakamoto. The Examiner is not allowed to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. *Id* F.3d at 1953 and USPQ2d at 1457.

One of ordinary skill in the art would not be motivated to combine the teachings of Sakamoto with the teachings of Saji because, firstly, the motors of Saji and Sakamoto are different types of motors. Saji describes a stepping motor which stops when controlling, e.g., a valve (page 3, lines 8-10) while Sakamoto describes a brushless motor used for driving rotating devices such as a video recorder (column 2, lines 9-12).

Further, the problems solved by Saji and Sakamoto are different. As discussed above, Saji states that the purpose of his invention is to increase the detent torque (page 7, lines 7-9). Sakamoto's goal, as also previously discussed, is to improve a torque ripple characteristic representative of torque fluctuation caused when rotated by excitation (column 2, lines 15-17). Since Sakamoto's motor has no cogging torque, which would be detrimental to Sakamoto, there would be no motivation to combine the teachings of Sakamoto with Saji, whose stated goal is to increase the detent torque. There is no reason, and no particular findings provided by the Examiner, as to why one of skill in the art, with no knowledge of the invention recited in claim 3, would have

selected the components of Sakamoto's motor for combination with the motor of Saji. The essence of hindsight is to piece together the disclosures of various prior art references without providing evidence of a suggestion, teaching or motivation to do so. *In re Dembiczak*, 175 F.3d 994, 50 USPQ2d 1614.

Still further, there is no suggestion to combine the teachings of Sakamoto with those of Saji because Sakamoto teaches away from its combination with Saji. For example, it is an objective of Sakamoto to provide a two-phase brushless motor in which extremely narrow magnetic poles are not provided, without generating torque ripples which would be detrimental to the intended purpose motor of Sakamoto, e.g., driving a VCR motor (Sakamoto, col. 2, lines 10-24). On the other hand, it is an objective of Saji to strengthen the detent torque of a step motor (Saji, page 3, lines 18-23). Therefore, the teachings of Sakamoto would teach away from the object of Saji's invention, thereby not providing any motivation to combine the aforementioned teachings. *Tec Air, Inc. v. Denso Manufacturing Michigan Inc.*, 192 F.3d 1353, 52 USPQ2d 1294 (Fed. Cir. 1999). As the Federal Circuit observes in *Tec Air*:

> "There is no suggestion to combine ... if a reference teaches away from its combination with another source ... 'A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant ... [or] if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant.' *In re Gurley* ... (Fed. Cir. 1994)." *Id.* F.3d at 1360 and USPQ2nd at 1298.

Furthermore, the brushless motor described by Sakamoto cannot be combined with the step motor of Saji because, to do so, would render the motor inoperable for its intended purpose. As mentioned previously, from the drawing of Sakamoto, the motor has no salient poles in its stator and, therefore, is a coreless motor. In such a motor, there is no change in magnetic reluctance between the stopping position and other positions of magnetic poles of the rotor. Therefore, the motor has no cogging torque and rotates smoothly, if not excited. Thus if Sakamoto were combined with Saji, such combination would render the step motor of Saji inoperable for its intended purpose which requires a strong detent force. Conversely, combining the step motor of Saji with

the brushless motor of Sakamoto would render Sakamoto's motor inoperable for its intended purpose where torque ripples are disadvantageous. As further noted in *Tec Air*:

> "If when combined, the references 'would produce a seemingly inoperative device,' then they teach away from their combination. *In re Sponnoble*, ... 405 F.2d 578, 587 160 USPQ 237, 244 (CCPA 1969); *see also In re Gordon* ... (Fed. Cir. 1984) (finding no suggestion to modify a prior art device where the modification would render the device inoperable for its intended purpose)." *Id.* F.3d at 1360 USPQ2d at 1298.

Appellants believe that it would be difficult for one of ordinary skill in the art to conceive the invention set forth in claim 3 from combining the structure of the motor of Sakamoto with Saji.

As recently noted by the Federal Circuit, references that teach away from the claimed invention cannot serve to create a prima facie case of obviousness. *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 60 USPQ2d 1001 (Fed. Cir. 2001). That is the precise situation with the attempt to combine Sakamoto with Saji. As a result, the rejection of claim 3 over the combination of Sakamoto with Saji fails. Claim 3 is patentable over the art of record.

CONCLUSION

In view of the foregoing, Appellants respectfully submit that claim 2 patentably defines over Saji, as well as the rest of the cited art. Also, claim 3 patentably defines over Saji in view of Sakamoto, as well as the remaining cited art.

Accordingly, it is respectfully requested that the Examiner's rejection be reversed.

Respectfully submitted,

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Date: 26 Feb. 2004

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IX. Appendix of Claims (37 C.F.R. §1.192(c(a))

2. A stepping motor in which a stator unit is composed of a pair of stator sub-assemblies integrally attached to each other in a back to back manner, each stator sub-assembly having a plurality of pole teeth formed at its inner circumference and housing a coil inside thereof, and a rotor unit is rotatably disposed with a small gap from the plurality of pole teeth and has multiple magnetic poles formed on a circumference thereof, the multiple magnetic poles of the rotor unit being formed by magnetizing the rotor unit alternately with an S pole and an N pole in a circumferential direction, wherein while a magnetic pole width consisting of the S pole and the width of the N pole in each pair are different from each other by a constant electrical angle ranging from 15 degrees to 50 degrees.

3. A stepping motor comprising:

a stator unit comprising a pair of stator sub-assemblies integrally attached to each other in a back to back manner, each of the stator sub-assemblies including:

a plurality of pole teeth formed at an inner circumference of the sub-assembly and housing a coil inside thereof;

a rotor unit rotatably disposed with a small gap from the plurality of pole teeth and has multiple magnetic poles formed on a circumference thereof, the multiple magnetic poles being formed by magnetizing the rotor unit alternately with an S pole and an N pole in a circumferential direction wherein one pair of the S pole and the N pole in which the width of the S pole is set to be smaller than

the width of the N pole and another pair of the S pole and the N pole in which the width of the S pole is set to be larger than the width of the N pole are alternately arranged.